

THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

This opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.

Paper No. 17

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UNITED STATES PATENT AND TRADEMARK OFFICE

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BOARD OF PATENT APPEALS  
AND INTERFERENCES

BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

Ex parte DAVID M. SCOTT

Appeal No. 95-1979  
Application No. 07/797,489<sup>1</sup>

ON BRIEF

Before GARRIS, FRANKFORT, and McQUADE, Administrative Patent Judges.

McQUADE, Administrative Patent Judge.

DECISION ON APPEAL

This appeal is from the final rejection of claims 1 through 19, all of the claims pending in the application.

<sup>1</sup> Application for patent filed November 22, 1991. According to the appellant, the application is a continuation-in-part of Application No. 07/531,328, filed May 31, 1990 (ABN).

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The invention relates to an interconnect structure for use in high density circuit applications. Claim 1 is illustrative and reads as follows:

1. An interconnect structure having a matrix formed of a continuous, substantially oxygen impermeable, anhygroscopic, inorganic dielectric material, the inorganic dielectric material having therein a dispersion of metal particles, at least substantially all of the metal particles being coated by an insulating coating, the dispersion containing a sufficient quantity of coated particles such that substantially all of the coated particles are in abutting contact with at least one other particle, the application of an electrical potential between spaced first and second points on the surface of the interconnect structure sufficient to cause electrical breakdown of the coatings on the particles in the region between the points of application irreversibly forming an electrical conduction path through the interconnect structure between the first and the second points.

The references relied upon by the examiner as evidence of obviousness are:

Treptow	2,993,815	Jul. 25, 1961
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Mastrangelo	3,926,916	Dec. 16, 1975
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Claims 1 through 19 stand rejected under 35 U.S.C. § 103 as being unpatentable over Treptow.

Claims 1 through 19 also stand rejected under 35 U.S.C. § 103 as being unpatentable over Mastrangelo in view of Treptow.

With regard to the first of these rejections, Treptow discloses a circuit element, e.g., a printed circuit board, comprising a highly conductive copper layer adherently bonded to a refractory substrate. Inasmuch as elemental copper does not readily wet and bond to the refractory substrates contemplated by Treptow, the copper layer is formed using a copper and glass containing paste. More specifically,

... an intimate mixture of finely divided copper or copper oxide and finely divided reduction-resistant glass is suspended in a volatile and decomposable fluid suspending medium. The mixture is applied to a refractory substrate which is first fired in an oxidizing atmosphere such as air or oxygen and is then fired in a controlled atmosphere of critical composition [column 1, lines 47 through 54].

The first firing step

... is carried out under conditions sufficient to volatilize the fluid suspending media, to oxidize at least the surface portion of the copper particles if metallic copper was initially used, and to commence formation of a refractory substrate-to-glass-to-copper oxide bond [column 3, lines 65 through 70].

Treptow indicates that this first firing step partially sinters the finely divided glass particles (see column 3, line 70 through column 4, line 8).

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The second firing step completes the refractory substrate-to-glass-to-copper oxide bond and reduces the copper oxide which has not been wetted by the glass (see column 4, lines 16 through 39). The result is "a metallic copper layer firmly bonded to the refractory substrate and exhibiting excellent electrical characteristics" (column 4, lines 42 through 44).

Due to the reduction which takes place during the second firing step, Treptow's finished or final article would not appear to meet the requirement in independent claims 1, 7 and 13 for at least substantially all of the metal particles dispersed in the matrix to be coated by an insulating coating. In apparent recognition of this deficiency in Treptow vis-a-vis the subject matter on appeal, the examiner states that he "is using Treptow's intermediate article to reject the claims, not Treptow's final article" (answer, page 7, emphasis in the original). The accompanying explanation indicates that the examiner is referring to Treptow's circuit element as it exists after the first firing step, but before the second firing step. As discussed above, the

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metal particles in this intermediate article are coated by an insulating oxide layer.

Nonetheless, the examiner's determination (see page 4 in the answer) that the glass component of this intermediate article constitutes "a matrix formed of a continuous, substantially oxygen impermeable, anhygroscopic, inorganic dielectric material" as recited in claims 1, 7 and 13 is not convincing. The finely divided glass particles used to form the glass component in Treptow's finished article are in a partially sintered state in the intermediate article. Thus, the appellant's contention (see pages 6 and 7 in the brief) that the glass in the intermediate article presents a discontinuous and porous structure is well taken.

Taking a somewhat different approach, the examiner also submits that "Appellant's example 1 at page 9 of the specification states that the present invention is satisfied by a can of native oxide coated aluminum powder. If an ordinary can of aluminum powder ... satisfies claim 1, Treptow must also satisfy claim 1" (answer, page 8). Suffice it to say that the

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examiner's understanding of what the appellant's specification states on page 9 is completely unfounded.

In light of the foregoing, Treptow neither teaches nor would have suggested a structure having all of the features set forth in independent claims 1, 7 and 13. Accordingly, we shall not sustain the standing 35 U.S.C. § 103 rejection of these claims, or of claims 2 through 6, 8 through 12 and 14 through 19 which depend therefrom, as being unpatentable over Treptow.

Nor shall we sustain the standing 35 USC 103 rejection of claims 1 through 19 as being unpatentable over Mastrangelo in view of Treptow.

Mastrangelo discloses a normally insulative or dielectric element comprising an organic polymeric binder carrying closely-packed, potentially conductive particles. The application of an electrical voltage exceeding a characteristic breakdown potential to spaced points on the element forms an electrically conductive path between the points. Mastrangelo explains that

... the particles have an electrically conductive interior and a dielectric surface that provides contact resistance when the particles touch so that conductive paths are not formed by the interconnection of

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particles in the binder. Upon electrical activation, the dielectric surface breaks down and is no longer effective in providing contact resistance between particles, thus allowing electrical contact between particles along a bridge type path....

The dielectric surface that makes a filler particle nonconductive can be formed by coating the surface of the particulate material with an insulative chemical compound of the metal being coated, such as an oxide, sulfide or nitride of the metal [column 5, lines 23 through 44].

Mastrangelo does not meet the limitations in independent claims 1, 7 and 13 calling for the matrix to be formed of an inorganic material. As noted above, Mastrangelo's matrix is an organic polymeric binder. According to the examiner, however,

[i]t would have been obvious for one of ordinary skill in the art to have used a glass binder in Mastrangelo as disclosed by Treptow. One of ordinary skill in the art would have been motivated to do this to form a tight bond between the particles used in Mastrangelo and a glass frit in a ceramics circuit board [final rejection (Paper No. 11), page 2].

Treptow's use of glass to adherently bond a copper layer to a refractory substrate has little, if any, pertinence to the normally insulative or dielectric element disclosed by Mastrangelo. The only suggestion for combining the disparate teachings of these references in the manner proposed by the

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examiner stems from hindsight knowledge derived from the appellant's own disclosure. The use of such hindsight knowledge to support a conclusion of obvious is, of course, impermissible.

The examiner is also of the view that "Mastrangelo does not teach an insulating coating on his metal particles" (answer, page 6) as recited in claims 1, 7 and 13, and that

[i]t would have been obvious for one of ordinary skill in the art to have used an oxide coating on Mastrangelo's conductors as taught by Treptow. One of ordinary skill would have been motivated to do this in order to obtain better bonding between a substrate and a conductor [answer, page 7].


As indicated above, however, Mastrangelo's metal particles do have insulating coatings thereon. Thus, the examiner's proposed modification of these particles to include such coatings in view of Treptow does not make sense and does nothing to cure Mastrangelo's failure to teach or suggest a matrix formed of an inorganic dielectric material as claimed.

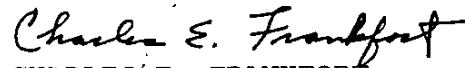


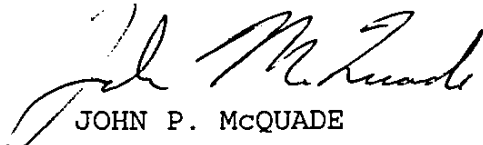
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In summary and for the above reasons, the decision of the examiner to reject claims 1 through 19 under 35 USC 103 as being unpatentable over Treptow alone and over Mastrangelo in view of Treptow is reversed.

REVERSED

  
BRADLEY R. GARRIS )  
Administrative Patent Judge)

  
CHARLES E. FRANKFORT ) BOARD OF PATENT  
Administrative Patent Judge) APPEALS AND  
INTERFERENCES

  
JOHN P. McQUADE )  
Administrative Patent Judge)

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George M. Medwick  
Patent Division  
Legal Department  
E.I. Du Pont De Nemours & Co.  
Wilmington, DE 19898